

LBNE LAr Parameters Spreadsheet

Version 10.5 - 10/18/2011

Changes highlighted in RED
unhide columns to see 34 kton option

33 kton

Input value
Calculated

Reference Design, 800'

Quality Meaning

- *** Stable, well understood parameter
- ** Reasonably well defined parameter
- * Rough estimate

Parameter	Value	Units	Quality	Notes
Anode Plane Assembly (APA)				
Cathode Plane Assembly (CPA)				
Detector Module				
Cryostat module				
Electronics				
Mux level	3840		**	Ref docdb
Readout redundancy	4		**	
Front end amplifier shaping time	1.0	micro-sec	***	Choices are 0.5, 1 and 2 micro-sec
Analog front end power	10	mW/chan	**	Design goal
Digital front end power	5	mW/chan	**	includes line driver power
Power conversion efficiency	80%		**	voltage drop in cables and regulator
Electronics power dissipation	19	mW/chan		
Electronics power total	5.2	kW		
ENC @ 90K	563	electrons	***	BNL ASIC measured
ENC @ 300K	1175	electrons	***	BNL ASIC measured
dE/dx (1 MIP)	2.1	MeV/cm	***	
W ion (ionization energy)	23.6	eV	***	
Recombination factor @ 500 V/cm	70%		***	NIM A523, 3 (2004)
Ionization 1 MIP - min	28030	electrons		
Electron drift velocity	1.6	mm/msec	***	Drift velocity for 500 V/cm electric field
Electron drift time	2.31	ms		
Electron lifetime assumption	1.4	ms	NA	Set to achieve minimum S/N = 9
Equivalent O2 contamination	229	ppt		ICARUS, A. Bettini, et al., NIM A305 (1991) 177.
Signal to noise ratio - max	50			For 1 MIP
Signal to noise ratio - min	10			For 1 MIP
Diffusion coefficient - Long	5.3	cm^2/s	**	
Diffusion coefficient - Trans	12.8	cm^2/s	**	at 500 V/cm (IEE Trans. on Dielectrics 5 (1968) 450)
Long diffusion rms at max drift	1.6	mm		
Trans diffusion rms at max drift	2.4	mm		
ADC sampling rate	2	MHz	**	Same as ICARUS, MicroBooNE and ArgoNeuT
Num MIP dynamic range	15		**	15 MIP ionization is a reasonable maximum value
ADC resolution - min	10	bits	**	Minimum value required
High Voltage				
Drift field	500	V/cm	***	Same as ICARUS, MicroBooNE and ArgoNeuT
Cathode high voltage	185	kV		
Num cathode HV feedthrough	8		*	
Grid bias voltage	-480	V	***	Adjust to achieve transparency. Doc #2833
U plane bias voltage	-280	V	***	Adjust to achieve transparency. Doc #2833
V plane bias voltage	0	V	***	Adjust to achieve transparency. Doc #2833
Collection plane bias voltage	700	V	***	Adjust to collect electrons. Doc #2833
Cryogenics				
Detector Depth				
Radioactive Background				
Veto System				
Veto Configuration				
Veto Counter				
Photon Detector				
DAQ				
Cavern & Pit				